

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte STEVEN P. DEN BAARS,
ERIC J. TARSA, MICHAEL MACK,
BERND KELLER AND
BRIAN THIBEAULT

Appeal 2006-1444
Application 09/528,262
Technology Center 1700

Decided: September 28, 2006

Before PAK, DELMENDO and JEFFREY T. SMITH, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal from the Examiner's final rejection of claims 4 through 7, 14, 15, 24, 30, 31, 33 through 42, 46, 47, 54, and 55. Claims 16, 25 through 29, 43, 44, and 48 through 53 stand withdrawn from consideration by the Examiner as being directed to a non-elected invention. Claim 9, the other claim remaining in the above-identified application,

stands allowed by the Examiner. We have jurisdiction pursuant to 35 U.S.C. § 134.

I. APPEALED SUBJECT MATTER

The subject matter on appeal is directed to a light emitting diode (LED) capable of generating different colors of light. See, e.g., claims 14, 30, 41, and 42, together with the Specification at 8. This diode may have “one or more active layers that can be double heterostructure, single quantum well, or multiple quantum well,” a pair of oppositely doped layers and a doped substrate. See, e.g., claim 14, together with the Specification at 8. In one exemplified embodiment, the diode is said to be nitride based and is said to have three active layers emitting different wavelengths of light. See Figure 2, together with the Specification at 9. In another exemplified embodiment, the diode is said to have a substrate with “color centers” doped with various rare earth and transitional elements. See Figure 5, together with the Specification at 12. Details of the appealed subject matter are recited in representative claims 14, 30, and 42 which are reproduced below:

14. A light emitting diode (LED), comprising:
an active region;
a pair of oppositely doped layers on opposite sides of said active layer which cause said active region to emit light at a predetermined wavelength in response to an electrical bias across said doped layers; and
a doped substrate, said active region and doped layers disposed successively on said substrate such that said substrate absorbs at least some of said light from said active region, said substrate doped throughout with a plurality of impurities such that said impurities simultaneously absorb the light of said active region and each re-emits a respective color of light.

30. A nitride based light emitting diode, comprising:
a plurality of active layers each of which is capable of emitting light at a predetermined wavelength;

a means for selectively causing each of said plurality with others of said plurality of active layers; and
a doped substrate, said plurality of active layers arranged vertically on said substrate with a plurality of doped semiconductor layers with each of said active layers sandwiched between two doped layers, said substrate absorbing at least some of said light from at least one of said plurality of active layers and re-emitting light at a different wavelength.

42. A light emitting diode, comprising:
an active layer;
a pair of oppositely doped layers on opposite sides of said active layer which cause said active layer to emit light at a predetermined wavelength in response to an electrical bias across said doped layers; and
a doped substrate, said active layer and doped layer arranged in a stack on said substrate such that said substrate absorbs at least some of said light from said active layer and re-emits light at a different wavelength,
and wherein said substrate is doped throughout with chromium, titanium, and cobalt, said doped substrate absorbing said active layer light and emitting red, green, and blue light.

II. PRIOR ART

As evidence of unpatentability of the claimed subject matter, the Examiner relies upon the following references:

McIntosh	US 5,684,309	Nov. 4, 1997
Bojarczuk Jr.	US 5,898,185	Apr. 27, 1999
Kaneko	US 6,239,901 B1	May 29, 2001
Nakao	10-56203	Feb. 24, 1998
(Published Japanese Patent Application) ¹		

The Appellants' admission at pages 1 through 4 of the Specification (hereinafter referred to as "the admitted prior art")

¹ Our reference to Nakao is to the English translation of record provided by the U.S. Patent and Trademark Office (not the machine translated copy).

III. REJECTION

The claims on appeal stand rejected as follows:²

1. Claims 5 through 7, 14, 24, and 41 under 35 U.S.C. § 102(b) as anticipated by the disclosure of Nakao;
2. Claims 4 through 7, 14, 15, 24, 41, and 42 under 35 U.S.C. § 102(b) as anticipated by the disclosure of Kaneko;
3. Claim 4 under 35 U.S.C. § 103 as unpatentable over the disclosure of Nakao;
4. Claims 15 and 42 under 35 U.S.C. § 103 as unpatentable over the combined disclosures of Nakao and Kaneko;
5. Claims 30, 31, 33 through 40, 54, and 55 under 35 U.S.C. § 103 as unpatentable over the combined disclosures of either Nakao or Kaneko, and McIntosh;
6. Claim 47 under 35 U.S.C. § 103 as unpatentable over the combined disclosures of Nakao, McIntosh, Bojarczuk and optionally Kaneko; and
7. Claim 46 under 35 U.S.C. § 103 as unpatentable over the combined teachings of Nakao, McIntosh, the admitted prior art and optionally Kaneko.

IV. FACTUAL FINDINGS AND CONCLUSIONS

We have carefully considered the claims, specification and prior art references, including the arguments advanced by both the Appellants and the Examiner in support of their respective positions. This review has led us to

² The Examiner has withdrawn all of the rejections directed to claim 9 and the § 112 rejection of claim 39.

conclude that the Examiner's §§ 102 and 103 rejections set forth in the Answer are well founded. Accordingly, we will sustain the Examiner's decision rejecting the claims on appeal under §§ 102 and 103 for the factual findings and conclusions set forth in the Answer. We add the following primarily for emphasis and completeness.

1. ANTICIPATION

As set forth in *Gechter v. Davidson*, 116 F.3d 1454, 1457, 43 U.S.P.Q.2d 1030, 1032 (Fed. Cir. 1997):

Under 35 U.S.C. §102, every limitation of a patent claim must identically appear in a single prior art reference for it to anticipate the claim.

In other words, anticipation requires that the claims on appeal “read on” something disclosed in the single prior art reference. See *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 772, 218 U.S.P.Q. 781, 789 (Fed. Cir. 1983).

Here, the Appellants do not specifically dispute the Examiner's finding that Nakao or Kaneko describes light emitting diodes (LED s) corresponding to those recited claims 5 through 7, 14, 24, and 41 or claims 4 through 7, 14, 15, 24, 41, and 42, respectively, except for the limitation “said substrate doped throughout with a plurality of impurities such that said impurities simultaneously absorb the light of said active region and each re-emits a respective color of light” recited in claim 14³. See the Brief, pages

³ Independent claims 41 and 42 also employ a limitation similar to the one recited in claim 14 which is said to be missing in Nakao and Kaneko. However, the appellants have not specifically argued the limitations of claims 41 and 42 and dependent claims thereof subject to the same grounds of rejection consistent with the requirements set forth in 37 C.F.R. §

11-20. The dispositive question is, therefore, whether Nakao or Kaneko expressly or inherently teaches the limitation in question. On this record, we answer this question in the affirmative.

As correctly found by the Examiner (Answer 5-6), Nakao teaches a light emitting diode having a doped substrate having homogeneously dispersed one or more doping agents, such as transition and rare earth elements, to form one or more light emitting centers for changing UV light emitted from semiconductor light-emitting element to any color of red, green and blue. Nakao specifically teaches, as an alternative embodiment, a doped substrate having “a large number of light-emitting regions for red, green and blue colors...” See Nakao at 0023. Similarly, as correctly found by the Examiner (Answer 7-8), Kaneko teaches a light emitting diode having a substrate which may be uniformly doped with a plurality of dopants to produce lights having different wavelengths. Thus, we concur with the examiner that claim 14, as recited, embraces the embodiments taught by both Nakao and Kaneko, i.e., the employment of plural impurities in different regions or the same region of a given substrate for the purposes of emitting more than one color of light.

As a rebuttal to the prima facie case of anticipation established by the Examiner, the Appellants assert that Nakao does not provide an enabling disclosure for the claimed subject matter. See Brief at 12-16. It is incumbent upon the Appellants to demonstrate that the disclosure of Nakao is non-enabling. See *In re Sasse*, 629 F.2d 675, 681-82, 207 U.S.P.Q.

41.37(c)(1)(vii)(2004). Therefore, for purposes of this appeal, we decide the propriety of the Examiner’s anticipation rejections based on claim 14 alone. See 37 C.F.R. 41.37(c)(1)(vii)(2004).

107, 111-12 (C.C.P.A. 1980); *In re Spence*, 261 F.2d 244, 246, 120 U.S.P.Q. 82, 83 (C.C.P.A. 1958). However, on this record, the Appellants have not presented any evidence to support their assertion that one of ordinary skill in the art would not have been able to make the claimed diode from the disclosure of Nakao, coupled with the information known in the art at the time of the invention, without undue experimentation. *Compare In re Vaeck*, 947 F.2d 488, 495, 20 U.S.P.Q.2d 1438, 1444 (Fed. Cir. 1991).

The Appellants also argue that “Kaneko does not disclose, teach or suggest an LED with a doped substrate where substrate does not have mirrors to provide laser emission.” See Brief at 19. We are not persuaded by this argument. The Appellants, by virtue of employing the transitional term “comprising” in claim 14, does not preclude the employment of mirrors described in Kaneko. In fact, the Appellants also employ mirrors according to the embodiment described at page 15 of the Specification.

Accordingly, we affirm the Examiner’s decision rejecting claims 5 through 7, 14, 24 and 42 under 35 U.S.C. § 102(b) as anticipated by the disclosure of Nakao and claims 4 through 7, 14, 15, 24, 41, and 42 under 35 U.S.C. § 102(b) as anticipated by the disclosure of Kaneko for the factual findings set forth in the Answer and above.

2. OBVIOUSNESS

To establish a prima facie case of obviousness under 35 U.S.C. § 103(a), there must be some teaching, suggestion and/or motivation in the applied prior art references taken as a whole and/or knowledge generally available to a person having ordinary skill in the art to direct that person to the claimed subject matter, without any recourse to the Appellants’

disclosure. See, e.g., *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573, 37 U.S.P.Q.2d 1626, 1629-30 (Fed. Cir. 1996). The knowledge generally available to a person having ordinary skill in the art includes facts admittedly well known in the art. *In re Nomiya*, 509 F.2d 566, 570-71, 184 U.S.P.Q. 607, 611-12 (C.C.P.A. 1975)(The admitted prior art in the Appellants' specification may be used in determining the patentability of a claimed invention.); see also *In re Davis*, 305 F.2d 501, 503, 134 U.S.P.Q. 256, 258 (C.C.P.A. 1962).

As evidence of obviousness of the subject matter defined by claim 4 under 35 U.S.C. § 103(a), the examiner relies on the disclosure of Nakao.⁴ The Appellants do not dispute the Examiner's determination that:

[I]t is well known to those of ordinary skill in the art at the time of the invention to form GaN-based LEDs so as to have either SQW [(single quantum wells)] or MQW [(multiple quantum wells)] active layers, and it would have been obvious to those persons to have employed either, depending only upon well-known design considerations.... [Compare Answer at 8 with Br. 20.]

The Appellants only repeat the same arguments addressed above. Thus, for the reasons stated *supra*, we also affirm the Examiner's decision rejecting claim 4 under 35 U.S.C. § 103(a) as unpatentable over the disclosure of Nakao.

As evidence of obviousness of the subject matter defined by claims 15 and 42 under 35 U.S.C. § 103(a), the Examiner relies on the disclosures of Kaneko and Nakao. The Examiner finds (Answer 9), and the Appellants do not dispute (Br. 22-23), that:

⁴ The Appellants' arguments are directed to claim 42 only. Thus, for purposes of this appeal, we limit our discussion to claim 42.

Kaneko discloses various III-N LED and LD emitters formed on activator-doped semiconductor substrates for absorption of a primary wavelength in the range of 400-550 nm (UV-yellow) for III-N materials (col. 4, lines 23; col. 5, line 7), and re-emission of a second wavelength from the doped substrate which is different/longer than that emitted from the primary LED source. The emitter may emit more than one wavelength (col. 10, lines 11-15). These wavelengths may or may not include the wavelength of the pumping light (the light that pumps the substrate activator centers)(col. 10, lines 29-36). The semiconductor substrate may be of various materials including sapphire (col. 3, lines 10-15). **Various dopants or activators may be employed including Cr, Ti and Co (col. 3, line 15).** The substrate may be uniformly or non-uniformly doped and a plurality of dopants can be utilized (col. 3, lines 15-20). **Various wavelengths including white** (i.e., B, G, R or B, Y) light can be selectively generated (col. 3, lines 45-50, col. 10, lines 30-36). [Emphasis original.]

Given the above uncontested factual findings, we determine that Kaneko alone would have rendered the subject matter defined by claims 15 and 42 prima facie obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103(a). As is apparent from the above findings, Kaneko would have suggested doping its substrate with Cr, Ti and Co, motivated by a reasonable expectation of successfully emitting lights with various wavelengths. Nakao is at best cumulative with respect to the teachings already provided by Kaneko.

Accordingly, for the factual findings set forth in the Answer and above, we affirm the Examiner's decision rejecting claims 15 and 42 under 35 U.S.C. § 103(a).

As evidence of obviousness of the subject matter defined by claims 30, 31, 33 through 40, 54 and 55 under 35 U.S.C. § 103(a), the examiner

relies on the combined disclosures of either Nakao or Kaneko, and McIntosh. The disclosures of Nakao and Kaneko are discussed above. According to the Examiner (Answer 10), neither Nakao nor Kaneko teaches employing multiple, stacked layers to emit light at different wavelengths.

To remedy this deficiency, the Examiner relies on the disclosure of McIntosh. *Id.* The Examiner finds (Answer 10), and the Appellants do not dispute (Br. 23-25), that:

McIntosh teaches stacked III-N LEDs having two or more quantum-well InGaN active layers that have the respective In concentrations set to emit various combinations such as blue and yellow, respectively, or B, G, R[,] respectively. Various embodiments depict multiple contacts for selective bias of one, some, or all of the active layers to emit any desired combination of the colors.

Moreover, the Appellants acknowledge at page 1 of the Specification that it is well known that light emitting diodes (LEDs)

generally comprise one or more active layers of semiconductor material sandwiched between oppositely doped layers. When a bias is applied across the doped layers, holes and electrons are injected into the active layer where they recombine to generate light...⁵

Given the above knowledge known to one of ordinary skill in the art, we concur with the Examiner that one of ordinary skill in the art would have been led to employ, inter alia, the well known multiple, stack layers in forming the LEDs of the type discussed in Nakao or Kaneko, motivated by a

⁵ This description of the multiple stack layer LED device corresponds the claimed means which is described at pages 9-11 of the Specification.

reasonable expectation of successfully emitting light at different wavelengths.

Accordingly, we affirm the Examiner's decision rejecting claims 30, 31, 33-40, 54, and 55 under 35 U.S.C. § 103(a).

As evidence of obviousness of the subject matter defined by claims 46 and 47 under 35 U.S.C. § 103(a), the Examiner relies on the combined disclosures of the Nakao/Kaneko/ McIntosh as applied above , and further in view of the admitted prior art or Bojarczuk . The Appellants do not challenge the Examiner's determinations that it would have been obvious to one of ordinary skill in the art to employ admittedly known yellow down-converting phosphors as required by claim 46 or to integrate, in accordance with the teachings of Bojarczuk, an electrical circuitry with the LED suggested by Nakao/Kaneko/McIntosh on a common substrate as required by claim 47. Compare Answer 12-13 with Br. 25-26. The Appellants only repeat the arguments directed to claim 30. Accordingly, for the reasons set forth in the Answer and above, we affirm the Examiner's decision rejecting claims 46 and 47 under 35 U.S.C. § 103(a).

V. CONCLUSION

The decision of the Examiner is affirmed.

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VI. TIME PERIOD

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

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